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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MALCOLM SCOTT ALLEN-WARE, JOHN BRUCE CARTER, ELMOOTAZBELLAH NABIL ELNOZAHY, and WEI HUANG

Appeal 2017-005228
Application 13/040,094
Technology Center 2800

Before TERRY J. OWENS, CHRISTOPHER L. OGDEN, and JULIA HEANEY, *Administrative Patent Judges*.

OWENS, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF THE CASE

The Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 1–20. We have jurisdiction under 35 U.S.C. § 6(b).

The Invention

The Appellants claim a method and computer usable program product for on-chip control of integrated circuit thermal cycling. Claims 1 and 8 are illustrative:

> 1. A computer implemented method for on-chip control of thermal cycling in an integrated circuit (IC), the method comprising:

configuring on the IC a first circuit for adjusting a first voltage being applied to a first part of the IC;

measuring a first temperature of the first part at a first time;

determining that the first temperature is outside a temperature range defined by an upper temperature threshold and a lower temperature threshold;

comparing the first temperature to a previous temperature, wherein the previous temperature is measured at the first part at a time prior to the first time;

determining a trend in a temperature change of the first part, wherein the trend is an increasing trend when the first temperature exceeds the previous temperature and the trend is a decreasing trend when the previous temperature exceeds the first temperature; and

adjusting the first voltage by variably reducing the first voltage from a nominal voltage in several steps when the first temperature exceeds the upper temperature threshold and by variably increasing the first voltage from a nominal voltage in several steps when the first temperature is below the lower temperature threshold, the adjusting slowing the trend and causing the first temperature of the first part to attain a value within the temperature range.

8. A computer usable program product comprising a computer usable storage device including computer usable code for on-chip control of thermal cycling in an integrated circuit (IC), the computer usable code comprising:

computer usable code for configuring on the IC a first circuit for adjusting a first voltage being applied to a first part of the IC;

computer usable code for measuring a first temperature of the first part at a first time;

computer usable code for determining that the first temperature is outside a temperature range defined by an upper temperature threshold and a lower temperature threshold;

comparing the first temperature to a previous temperature, wherein the previous temperature is measured at the first part at a time prior to the first time;

> determining a trend in a temperature change of the first part, wherein the trend is an increasing trend when the first temperature exceeds the previous temperature and the trend is a decreasing trend when the previous temperature exceeds the first temperature; and
>
> computer usable code for adjusting the first voltage by variably reducing the first voltage from a nominal voltage in several steps when the first temperature exceeds the upper temperature threshold and by variably increasing the first voltage from a nominal voltage in several steps when the first temperature is below the lower temperature threshold, the adjusting slowing the trend and causing the first temperature of the first part to attain a value within the temperature range.

The References

Rotem	US 2006/0034343 A1	Feb. 16, 2006
Dobberpuhl	US 2007/0001697 A1	Jan. 4, 2007
Chaparro Monferrer	US 2008/0236175 A1	Oct. 2, 2008
Kameyama	US 2009/0295458 A1	Dec. 3, 2009
Laitinen	US 2011/0205888 A1	Aug. 25, 2011 (filed Feb. 25, 2010)

The Rejections

The claims stand rejected as follows: claims 8–16 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention, claims 8–16 under 35 U.S.C. § 101 as failing to claim patent eligible subject matter, claims 1, 7, 8 and 14–17 under 35 U.S.C. § 103 over Kameyama in view of Dobberpuhl and Laitinen, claims 2–4, 9–11 and 18–20 under 35 U.S.C. § 103 over Kameyama in view of Dobberpuhl, Laitinen and Chaparro Monferrer, and claims 5, 6, 12 and 13 under 35 U.S.C. § 103 over Kameyama in view of Dobberpuhl, Laitinen and Rotem.

OPINION

We reverse the rejections.

Rejection under 35 U.S.C. § 112, second paragraph

"[T]he indefiniteness inquiry asks whether the claims 'circumscribe a particular area with a reasonable degree of precision and particularity.'" *Marley Mouldings Ltd. v. Mikron Industries Inc.*, 417 F.3d 1356, 1359 (Fed. Cir. 2005), quoting *In re Moore*, 439 F.2d 1232, 1235 (CCPA 1971).

The Examiner concludes that claim 8 and its dependent claims 9–16 are unclear because claim 8 claims a computer usable program product including computer usable code, but the recited computer usable code comprises "comparing" and "determining" which actually are not computer usable code but, rather, are method steps (Non-final Act. 3; Ans. 3–4).[1]

Although claim 8 lacks "computer usable code for" before "comparing" and "determining", the recitation that the claim limitations are computer usable code and the appearance of "computer usable code" before every other claim limitation indicate with a reasonable degree of precision and particularity that "comparing" and "determining" mean "computer code for comparing" and "computer code for determining".

Accordingly, we reverse the rejection under 35 U.S.C. § 112, second paragraph.

[1] Citations herein are to the non-final action mailed May 19, 2016.

Rejection under 35 U.S.C. § 101

"Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title." 35 U.S.C. § 101. The Supreme Court stated in *Bilski v. Kappos*, 561 U.S. 593, 601 (2010) that "[t]he Court's precedents provide three specific exceptions to § 101's broad patent-eligibility principles: 'laws of nature, physical phenomena, and abstract ideas.' [*Diamond v.*] *Chakrabarty*, [447 U.S. 303,] 309, 100 S. Ct. 2204 [(1980)]."

The Examiner concludes that claims 8–16 claim software per se and, therefore, fail to claim patent eligible subject matter (Non-final Act. 3–4; Ans. 4).

The Supreme Court and the Federal Circuit have not treated claims to computer readable storage media containing instructions for performing methods as per se patent ineligible but, rather, with respect to patent eligibility have treated those claims the same way as claims to the performed methods. *See Alice Corp. Pty. Ltd. v. CLS Bank Intern.*, 134 S. Ct. 2347, 2353, 2360 (2014); *Amdocs (Israel) Ltd. v. Openet Telecom, Inc.*, 841 F.3d 1288, 1299, 1304 (Fed. Cir. 2016); *CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366, 1373–74 (Fed. Cir. 2011).

The Examiner concludes that "Applicant's 'computer program product' encompasses both statutory and non-statutory media including but not limited to carrier waves" (Non-final Act. 4) and "the 'computer usable storage device' of the preamble potentially amounts to the recitation of transitory medium, when read reasonably broadly" (Ans. 4).

The Federal Circuit has held that transitory, propagating signals are patent ineligible. *See In re Nuijten*, 500 F.3d 1346, 1357 (Fed. Cir. 2007). The Appellants' Specification states that "[t]he computer readable medium may be a computer readable signal medium or a computer readable storage medium" (Spec. ¶ 84). The Appellants' claims 8–16, however, are limited to a computer usable storage device. The Appellants' Specification states that "[i]n the context of this document, a computer readable storage device may be any tangible device or medium that can contain, or store a program for use by or in connection with an instruction execution system, apparatus, or device" (*id.*). Thus, the Appellants' claim term "computer usable storage device" excludes transitory media such as carrier waves.

We therefore reverse the rejection under 35 U.S.C. § 101.

Rejections under 35 U.S.C. § 103

We need address only the independent claims, i.e., 1 and 8.[2]

Setting forth a prima facie case of obviousness requires establishing that the applied prior art would have provided one of ordinary skill in the art with an apparent reason to modify the prior art to arrive at the claimed invention. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

Kameyama prevents thermal runaway of an integrated circuit chip having a built-in central processing unit (CPU) by gradually decreasing the CPU operation clock's frequency and, consequently, the CPU's processing capacity, as the chip's temperature increases above a selected minimum

[2] The Examiner does not rely upon Chaparro Monferrer or Rotem for any disclosure that remedies the deficiency in Kameyama, Dobberpuhl and Laitinen as to the limitations in the independent claims (Non-final Act. 10–15).

value (e.g., 95 ºC), and when the chip's temperature reaches a selected maximum value (e.g., 135 ºC), turning off the clock and the CPU's internal operating power supply voltage until the chip's temperature falls below the selected minimum value, at which time the CPU's normal operation clock's frequency and internal operating power supply voltage are resumed (¶¶ 16, 17, 116–120, 130).

Dobberpuhl manages an integrated circuit chip's power consumption using measurement units (18A–C) on the chip, each measurement unit measuring the supply voltage at which circuitry in the measurement unit operates correctly at the measurement unit's operating frequency, and outputting to a control unit (20) signals indicating the supply voltage increase or decrease needed to provide the integrated circuit supply voltage at which the integrated circuit is operable at a given operating frequency (¶¶ 8–10, 30, 49; Fig. 1).

Laitinen discloses a packet-based communication apparatus which controls its temperature by dropping packets and thereby decreasing the data rate as the temperature approaches a temperature threshold (¶¶ 6, 22, 27). At a temperature exceeding a maximum threshold, parts of the apparatus which consume electrical power, such as the transmitter and/or receiver, are switched off (¶ 26).

The Examiner concludes that in view of Dobberpuhl, "[i]t would have been obvious to variably change [Kameyama's] first voltage from a nominal voltage in several steps because doing so would have been an advantageous way of controlling the temperature of the integrated circuit without the need to take more drastic measures, such as turning off the integrated circuit entirely" (Non-final Act. 7).

The Examiner does not establish that Dobberpuhl's disclosure of varying supply voltage to manage chip power consumption would have provided one of ordinary skill in the art with an apparent reason to gradually stop Kameyama's CPU's internal operating power supply voltage which is stopped to prevent thermal runaway when the chip temperature exceeds a maximum threshold. Nor does the Examiner establish that Kameyama's integrated circuit would function properly during stepwise reduction of the CPU's internal operating power supply voltage.

The Examiner concludes that in view of Laitinen, "[d]etermining a rising or falling temperature trend in such a way would have been obvious because knowing whether temperature is rising or falling would have been useful for the act of adjusting voltage to keep the chip temperature within a permissible limit of ranges [*for example, see Kameyama Paragraph [0130] – the range of '95º C' to '130º C'*]" (Non-final Act. 8).

Kameyama does not control the chip temperature within a particular range such as 95–135 ºC but, rather, starts to control the temperature if it has risen above a selected value such as 95 ºC (¶ 116). Lower temperatures are within Kameyama's normal operation temperature range (*id.*). The Examiner does not establish that Laitinen's disclosure of reducing packet-based communication apparatus temperature by dropping packets would have provided one of ordinary skill in the art with an apparent reason to keep Kameyama's chip temperature above a lower limit. Thus, the Examiner does not establish that the applied references would have suggested "adjusting the first voltage . . . by variably increasing the first voltage from a nominal voltage in several steps when the first temperature is

below the lower temperature threshold" as required by the Appellants' claims 1 and 8.

For the above reasons we reverse the rejections under 35 U.S.C. § 103.

DECISION/ORDER

The rejections of claims 8–16 under 35 U.S.C. § 112, second paragraph, claims 8–16 under 35 U.S.C. § 101, claims 1, 7, 8 and 14–17 under 35 U.S.C. § 103 over Kameyama in view of Dobberpuhl and Laitinen, claims 2–4, 9–11 and 18–20 under 35 U.S.C. § 103 over Kameyama in view of Dobberpuhl, Laitinen and Chaparro Monferrer, and claims 5, 6, 12 and 13 under 35 U.S.C. § 103 over Kameyama in view of Dobberpuhl, Laitinen and Rotem are reversed.

It is ordered that the Examiner's decision is reversed.

REVERSED